

What is Claimed is:

- 5 1. A method for the conversion of a coal-containing feedstock to a gas product comprising methane, comprising contacting said coal feedstock with a treatment gas comprising at least about 40 weight percent H₂ at a reaction temperature of at least about 600°C for a time sufficient to convert at least about 90 percent of the volatile matter in the coal-containing feedstock to methane and form a purified carbon product.
- 10 2. A method as recited in Claim 1, wherein said coal feedstock comprises low-grade coal having a sulfur content of at least about 2 weight percent.
- 15 3. A method as recited in Claim 1, wherein said reducing gas comprises at least about 99 weight percent H₂.
- 20 4. A method as recited in Claim 1, wherein said reducing gas is formed by steam oxidation of iron.
- 25 5. A method as recited in Claim 1, wherein said reducing gas comprises H₂ and CO.
- 30 6. A method as recited in Claim 1, wherein said reducing gas is formed by partial oxidation of carbon.
7. A method as recited in Claim 1, wherein said reaction temperature is from about 700°C to about 900°C.
8. A method as recited in Claim 1, further comprising the step of combusting at least a portion of said methane to generate electricity.
9. A method as recited in Claim 1, further comprising the step of combusting at least a portion of said methane in a combined cycle generator to generate electricity.
10. A method as recited in Claim 1, further comprising the step of reacting said purified carbon product and at least a portion of said methane in a boiler to generate electricity.
- 30 11. A method as recited in Claim 1, further comprising the step of diverting at least a portion of said treatment gas and combining said portion with said methane.

12. A method for the conversion of a coal-containing feedstock to a gas product comprising methane, comprising the steps of:

5 a) forming a H₂/CO treatment gas by the partial oxidation of carbon;

10 b) contacting said H₂/CO treatment gas with a coal feedstock at a reaction temperature of from about 700°C to about 900°C and for a reaction time sufficient to convert at least a portion of the volatile matter in the coal-containing feedstock to a product gas comprising methane;

15 c) recovering a purified carbon product from said contacting step; and

20 d) recycling at least a first portion of said purified carbon product to said step of forming a H₂/CO treatment gas.

13. A method as recited in Claim 12, further comprising the step of transporting at least a second portion of said purified carbon product to a boiler and combusting said purified carbon product.

14. A method as recited in Claim 12, further comprising the step of transporting at least a second portion of said purified carbon product to a boiler and combusting said purified carbon product with at least a portion of said methane.

15. A method as recited in Claim 12, further comprising the step of combusting at least a portion of said methane in a combined cycle generator.

16. A method for the treatment of coal, comprising the steps of:
e) forming a H₂/CO treatment gas by the partial oxidation of
carbon;
f) contacting said H₂/CO treatment gas with a coal
feedstock at a reaction temperature and for a reaction time sufficient to
remove at least about 95 weight percent of the volatile matter in the coal-
containing feedstock; and
g) recovering a purified carbon product from said contacting
step.
- 5 17. A method as recited in Claim 16, further comprising the step
of combusting at least a portion of said purified carbon product in a boiler.
- 10 18. A method as recited in Claim 16, further comprising the step
of recycling at least a second portion of said purified carbon product to
said contacting step.
- 15 19. A method as recited in Claim 16, wherein said contacting
step converts said volatile matter to a methane-containing gas and
wherein said step of combusting comprises combusting said methane-
containing gas with said purified carbon product.
- 20 20. A method as recited in Claim 16, further comprising the step
of combusting at least a portion of said methane in a combined cycle
generator.

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21. A method for the manufacture of a high purity coke product, comprising the steps of providing a coal feedstock having a sulfur content of at least about 1 weight percent and contacting said coal feedstock with a gas stream comprising hydrogen gas for a time and at a temperature sufficient to form a coke product having a sulfur content of not greater than about 0.1 weight percent.

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22. A method as recited in Claim 21, wherein said coal feedstock has a sulfur content of at least about 2 weight percent.

23. A method as recited in Claim 21, wherein said gas stream comprises at least about 99 weight percent hydrogen gas.